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Amino-Acid-based Task Specific Ionic Liquids for CO₂ capture

Giulio Latini,^{a,b,c} Sergio Bocchini,^a Valentina Crocellà,^c Matteo Signorile,^c Candido Fabrizio Pirri^{a,b} and Silvia Bordiga^c

^a Centre for Sustainable Future Technologies CSFT@PoliTo Istituto Italiano di Tecnologia, Corso Trento 21, 10129, Torino, Italy

^b Department of Applied Science and Technology, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129, Torino, Italy

^c Department of Chemistry, NIS and INSTM Reference Centre, University of Turin, Via G. Quarello 15, I-10135 and Via P. Giuria 7, I-10125, Turin, Italy
E-mail: giulio.latini@iit.it

The problem of the high concentration of CO₂ in the atmosphere is encouraging the development of novel and efficient system for the reversible capture of the CO₂. The amine scrubbing of flue gases is a well-known technology but it still has several drawbacks (e.g. corrosion and toxicity). Recently Task Specific Ionic Liquids (TS-ILs) have been considered as alternative for the highly efficient capture of CO₂ via chemical fixation [1] and overcome the performance of the usual aqueous amine solution. Nonetheless, the most common cations employed in ILs, imidazolium, pyridinium and phosphonium, revealed to be not environmental friendly and to be toxic for the microorganisms and cells. Instead, the cholinium-based ILs demonstrate to be an interesting alternative to usual ILs [2]. The Choline is a water-soluble essential nutrient, it has relatively low toxicity and it consists of a tetraalkyl-ammonium head linked to a polar hydroxyl tail. On the anion side, the amino acids (AA) are a fully sustainable and non-toxic source of counter-ion with amine functionalities. The first synthesis of Choline AA-ILs was carried out through Choline Hydroxide intermediate [1]. Only recently, a newer and simpler method was developed to synthesize the Choline AA-ILs [3].

In this work, the CO₂ absorption of two Choline-based AA-ILs were studied, aiming to enlight the mechanism of absorption. Choline Glycinate and Choline Alaninate were synthesized using the newer method. The absorption of the pure AA-ILs and their solutions with DMSO were measured, as well as other chemo-physical properties. The overall mechanism of absorption was deeply investigated by means of infrared spectroscopy using a peculiar Attenuated Total Reflectance setup in order to determine the interaction between the IL, the solvent and the CO₂.

[1] G. Cui, J. Wang, and S. Zhang Chem. Soc. Rev. **45** (2016) 4307–4339.

[2] X.D. Hou, Q.P. Liu, T.J. Smith, and M.H. Zong PLoS ONE, **8** (2013) e59145.

[3] S. Bocchini, S. Hernandez, S. Bianco, A. Chiappone, G. Saracco, C.F. Pirri, (2016) Merck Young Chemists Symposium, Rimini (IT), 25-27th October, 2016. p. 24